

CLAIMS

1. A method for fixed bit rate, intraframe compression of video, including a sequence of images, comprising, for each image:
 - transforming portions of the image to generate frequency domain coefficients for each portion;
 - selecting a quantization matrix according to the desired bit rate;
 - determining a bit rate for each transformed portion using a plurality of scale factors;
 - estimating distortion for each portion according to the plurality of scale factors;
 - selecting a scale factor for each portion to minimize the total distortion in the image to achieve a desired bit rate;
 - quantizing the frequency domain coefficients for each portion using the selected quantization matrix as scaled by the selected scale factor for the portion;
 - entropy encoding the quantized frequency domain coefficients using a variable length encoding to provide compressed data for each of the defined portions; and
 - outputting the compressed data for each of the defined portions to provide a compressed bitstream at the desired bit rate.
2. The method of claim 1, wherein the distortion is estimated according to a square of the scale factor.
3. The method of claim 1, wherein quantizing the frequency domain coefficients further comprises scaling using a weighting factor selected from among a plurality of weighting factors according to the bit depth of the image data.
4. The method of claim 1, wherein each of the plurality of scale factors is a power of two.
5. The method of claim 4, wherein the selected scale factor is a power of two.
6. The method of claim 1, wherein determining a bit rate comprises:

determining a maximum scale factor that will cause the image data to be completely quantized; and

interpolating to provide an estimated bit rate for one or more scale factors between the maximum scale factor and a largest scale factor for which a bit rate has been determined.

7. The method of claim 1, wherein entropy encoding comprises:

for each nonzero value not preceded by a zero value, determining whether the nonzero value is in a base range or an index range;

for each nonzero value not preceded by a zero value and in the base range, encoding the nonzero value using a code word from a first set of code words;

for each nonzero value not preceded by a zero value and in the index range, determining an index and encoding the nonzero value using a code word from a second set of code words, followed by the index;

for each nonzero value preceded by a zero value, determining whether the nonzero value is in a base range or an index range;

for each nonzero value preceded by a zero value and in the base range, encoding the nonzero value using a code word from a third set of code words and encoding the zero value using a code word from a fifth set of code words and after the code word for the nonzero value; and

for each nonzero value preceded by a zero value and in the index range, determining an index and encoding the nonzero value using a code word from a fourth set of code words, followed by the index and encoding the zero value using a code word from the fifth set of code words and after the code word for the nonzero value.

8. The method of claim 1, wherein the quantization matrix includes a plurality of quantizers, wherein each quantizer corresponds to a frequency coefficient, and wherein quantizing the frequency coefficients includes quantizing each frequency coefficient using the corresponding quantizer so as to provide a deadzone having a width greater than a value of the quantizer.

9. A method for entropy encoding a series of values, comprising:

for each nonzero value not preceded by a zero value, determining whether the nonzero value is in a base range or an index range;

for each nonzero value not preceded by a zero value and in the base range, encoding the nonzero value using a code word from a first set of code words;

for each nonzero value not preceded by a zero value and in the index range, determining an index and encoding the nonzero value using a code word from a second set of code words, followed by the index;

for each nonzero value preceded by a zero value, determining whether the nonzero value is in a base range or an index range;

for each nonzero value preceded by a zero value and in the base range, encoding the nonzero value using a code word from a third set of code words and encoding the zero value using a code word from a fifth set of code words and after the code word for the nonzero value; and

for each nonzero value preceded by a zero value and in the index range, determining an index and encoding the nonzero value using a code word from a fourth set of code words, followed by the index and encoding the zero value using a code word from the fifth set of code words and after the code word for the nonzero value.

10. A method for optimization of bit rate and distortion in compression of data, comprising:

determining a bit rate for each portion of the data being compressed using a plurality of scale factors, including:

determining a maximum scale factor that will cause total distortion to the portion of the data; and

interpolating between the maximum scale factor and largest scale factor for which a bit rate has been determined to estimate a bit rate corresponding to a scale factor between the largest scale factor and the maximum scale factor;

estimating distortion for each portion of the data being compressed according to the plurality of scale factors; and

selecting scale factors for each portion to minimize the total distortion of the data to achieve a desired bit rate.